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PATENT SPECIFICATION

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(19)

(54) IMPROVEMENTS IN VIBRATORY SCREENING APPARATUS FOR FINELY DIVIDED MATERIAL

(71) We, DERRICK MANUFACTURING CORPORATION, a corporation organised under the laws of the State of New York, United States of America, of 590 Duke Road, Buffalo, New York 14225, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to industrial screening equipment and more particularly to novel non-clogging screen cloth assemblies.

A very pressing problem exists in the screening art, particularly when screening finely divided material, due to the tendency of the material being screened to clog the openings in the screen cloth. This condition is sometimes referred to in the art as "blinding" of the screen surface. This blinding of the screen cloth greatly impairs the effectiveness of the screening capacity of the apparatus and may even reduce such capacity substantially to zero. Various methods have been employed to remove particles which have become wedged in the openings of the screen cloth as by shaking or the like, but none of these expedients has proved effective with particles of certain shapes.

It is conventional in the art to provide a backing or supporting screen beneath the primary screen cloth but such backing screens have openings a number of times greater than the openings in the screen cloth and are provided for structural support of the screen cloth and do not of themselves perform any screening function.

The present invention provides a novel screen cloth structure which solves the clogging or "binding" problem in a new manner by preventing the wedging of particles in the screen openings rather than by attempting to dislodge particles after they have become wedged in the screen openings.

According to the present invention there is provided in a vibratory screening apparatus for finely divided material, a pair of screen cloths in face to face abutment for receiving material to be screened thereon, the openings in the screen cloths being at least twice as wide as the wire diameters thereof, a frame for supporting said screen cloths, the lower screen cloth having openings therein at least as large as the openings in the upper screen cloth but not in excess of 50% larger than the openings in the upper screen cloth and with the majority of the openings in the upper screen cloth intersected by the wires of the lower abutting screen cloth, said frame being arranged to present an upwardly arched surface for supporting said screen cloths in upwardly arched formation, whereby the wires of each screen cloth are held securely against those wires of the other screen cloth which are perpendicular thereto to lock the wires of one screen cloth into the wires of the other in such manner that the plane defining the upper surfaces of the lower screen cloth is above the plane defining the lower surfaces of the upper screen cloth whereby the wires of said lower screen cloth effectively prevent a generally spheroidal particle from becoming lodged in an opening of said upper screen cloth, said arched formation further serving to inhibit relative vertical movement of said screen cloths during vibration thereof.

The lower screen cloth is not to be confused with the backing screen referred to above and in fact a third substantially coarser backing screen will preferably be used beneath the pair of screen cloths referred to here.

The mesh size of the screen cloths per se may be approximately the same although, for reasons which will appear later herein, it will generally be preferable to use a screen cloth of slightly larger mesh openings beneath the top screen cloth.

In pursuing the principles of the present invention the openings in the screen cloths will be at least twice the width of the wire

diameters and preferably at least two and a half times the wire diameter or more. Accordingly, when a particle of a size which might wedge into the opening of the top screen cloth tends to enter an opening therein it comes into contact with a wire of the lower screen cloth and is thus prevented from getting into a wedging position.

Fig. 1 is a fragmentary top plan view of the left-hand portion of a screen frame constructed according to one form of the present invention;

Fig. 2 is a fragmentary view taken similarly to Fig. 1 but on an enlarged scale and rotated through 90 degrees relative to Fig. 1;

Fig. 3 is a transverse cross-sectional view through the left-hand side of the screen structure of Figs. 1 and 2 on a generally vertical plane;

Fig. 4 is a much enlarged top plan view of one form of the screen arrangement of the present invention;

Fig. 5 is a transverse cross-sectional view through the screen structure of Fig. 4;

Fig. 6 is a view similar to Fig. 4 but showing the screen members in different relative positions; and

Fig. 7 is a view similar to Fig. 5 but showing the embodiment of Fig. 6.

The general framing and support structure of the screen illustrated herein by way of example is conventional and comprises a rectangular frame 10 having a rigid screen support structure comprising a series of parallel stringer members 11 which extend longitudinally with respect to the direction of movement of material along the screen. So-called bulkhead members 12 extend parallel to each other between stringers 11 and are welded at their ends to the stringers 11. The bulkheads and stringers are arranged to present an upwardly arched surface so that the screen elements are stretched over the top surface of the arch thus formed, as fragmentarily indicated in Fig. 3. It is to be understood that all of the foregoing is conventional in screening apparatus of the type here under consideration.

The top and bottom screen cloths which are sandwiched together are indicated at 14 and 15 in Fig. 3 and are jointly wrapped into a return-bent channel member 16 at their side edges. Flanges 17 are fixed to the side edges of frame 10 and a rail member 20 has a flange portion 21 which engages the return-bent member 16, as clearly shown in Fig. 3, and draws the same generally outwardly and downwardly by virtue of a bolt and nut connection 22 between rail member 20 and flange 17. A much coarser backing screen 24 underlies the two screen cloths 14 and 15 and the return-bent member 16 and rests upon the top surface of frame 10 and upon the stringers and bulkheads of the screen frame. In the present instance a cushioning strip 26 is interposed between frame 10 and backing screen 24.

As indicated earlier herein, the backing screen is a conventional expedient for supporting relatively fine screen cloths and has openings a number of times greater than the screen element openings and performs no screening function but serves entirely as a support for the screen cloths.

In the instance illustrated in Figs. 4 and 5 the upper and lower screen cloths 14 and 15 are of the same mesh size and in such illustrated instance the wires of the lower screen cloth are arranged to be staggered with respect to the wires of the upper screen cloth so that each lower screen cloth wire lies approximately halfway between two superposed wires of the upper screen cloth. In alternative arrangements the wires of the lower screen cloth may be offset somewhat from this centered arrangement and indeed may be offset in one horizontal direction only, although such lower wires should be sufficiently offset from the upper wires to engage and dislodge particles which might tend to blind the upper screen openings or, in fact, to prevent the engagement of such particles in the upper screen openings.

By way of example, Figs. 6 and 7 show an instance wherein the lower screen cloth is substantially offset from the centered arrangement illustrated in Figs. 4 and 5. Since the screen cloths of Figs. 6 and 7 are otherwise identical with those of Figs. 4 and 5 like numerals have been applied to the several parts in Figs. 6 and 7.

In many, if not most, instances the lower screen cloth may have somewhat larger mesh openings than the upper screen cloth but not of such degree as to leave a major portion of the openings of the upper screen cloth without underlying wires of the lower screen cloth.

This relationship between mesh size registry of the wires of the two screen cloths is subject to coinsiderable variation and is in general empirically determined by the type of material being screened and the general shapes and contours of the particles of such material.

While the relationship between the mesh size of the two screen cloths varies in accordance with various operating conditions and the type and size of material being screened, the size of the openings of the lower screen cloth will in general vary between a minimum size opening which is equal to that of the upper screen cloth and a maximum size opening which is 50% greater than the opening of the upper screen cloth. In all cases the openings in the screen cloths will be of a width at least twice the diameter of the wires of the screen cloth as

to both the upper and lower screen cloths.

In Fig. 5 is will be noted that the actual effective mesh opening would be as indicated by the dimension B indicating the space between a wire of lower screen 15 and the adjacent corresponding wire of upper screen 14. This dimension will be greater and more nearly approach the particles size opening of the upper screen cloth when the wires of the lower screen cloth are offset with respect to the wires of the upper screen cloth but not centered therebeneath as in Fig. 5. Where a larger mesh opening is employed in the lower screen cloth 15 dimension B will be variable across the surfaces of the two screen cloths.

Merely by way of example, it will be noted that wire 28 of lower screen cloth 15 prevents lodgment of a particle A in the opening of upper screen cloth 14. With particle A resting on wire 28 of screen 15 as in Fig. 5, there will be a slight lateral clearance between particle A and the two adjacent wires of screen 14 so that there is no tendency of particle A to become lodged between such two wires. There is no tendency of particles to lodge in the space indicated by the dimension B due to slight relative movement between the screens which is a natural result of the rapid vertical vibration to which the screen cloths are subject during screening operations, such vertical vibrations tending to cause the upper screen cloth to move upwardly slightly away from the lower screen cloth and back toward the same during vibrational movements. The relative movement is only slight because it is inhibited by the arched formation of the screen cloths. Also, because of the arched condition of the screen cloths, there is a very slight relative movement of the two screen cloths in their plane of extent as the screen is vibrated.

Preferred embodiments of the present invention have been described herein and shown in the accompanying drawings to illustrate the underlying principles of the invention but it is to be understood that numerous modifications may be made without departing from the broad scope of the invention as defined by the appended claims.

WHAT WE CLAIM IS:—

1. In a vibratory screening apparatus for finely divided material, a pair of screen cloths in face to face abutment for receiving material to be screened thereon, the openings in the screen cloths being at least twice as wide as the wire diameters thereof, a frame for supporting said screen cloths, the lower screen cloth having openings therein at least as large as the openings in the upper screen cloth but not in excess of 50% larger than the openings in the upper screen cloth and with the majority of the openings in the upper screen cloth inersected by the wires of the lower abutting screen cloth, said frame being arranged to present an upwardly arched surface for supporting said screen cloths in upwardly arched formation, whereby the wires of each screen cloth are held securely against those wires of the upper screen cloth which are perpendicular thereto to lock the wires of one screen cloth into the wires of the other in such manner that the plane defining the upper surfaces of the lower screen cloth is above the plane defining the lower surfaces of the upper screen cloth whereby the wires of said lower screen cloth effectively prevent a generally spheroidal particle from becoming lodged in an opening of said upper screen cloth, said arched formation further serving to inhibit relative vertical movement of said screen cloths during vibration thereof.

2. Screening apparatus according to Claim 1, wherein a backing screen of a mesh substantially coarser than the mesh of the screen cloths underlies the lower screen cloth to support the screen cloths.

3. Screening apparatus according to Claim 1 or Claim 2, wherein the openings in the upper and lower screen cloths are of the same size and wherein the wires of the lower screen cloth are offset in at least one horizontal direction with respect to the wires of the upper screen cloth.

4. Screening apparatus according to Claim 1 or Claim 2, wherein the openings in the lower screen cloth are larger than the openings in the upper screen cloth.

5. Screening apparatus according to any one of the preceding claims, wherein said frame includes a series of spaced parallel stringers.

6. Vibratory screening apparatus for finely divided material, constructed and adapted to operate substantially as hereinbefore described with reference to each of the embodiments illustrated in the accompanying drawings.

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Sheet 1

Fig. 1.

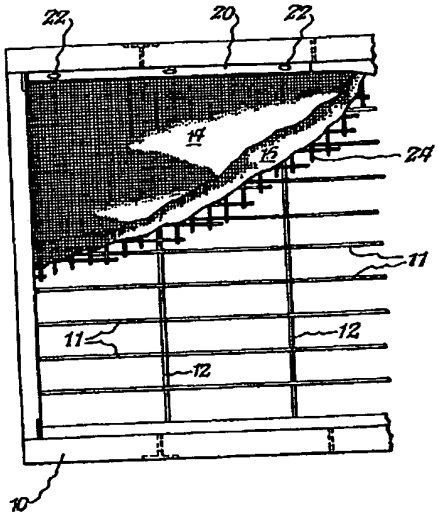


Fig. 2.

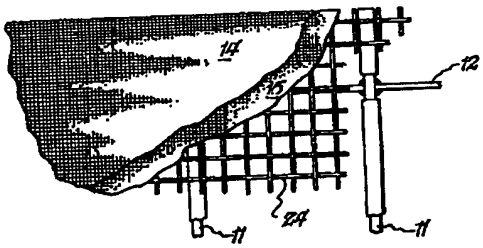


Fig. 3.

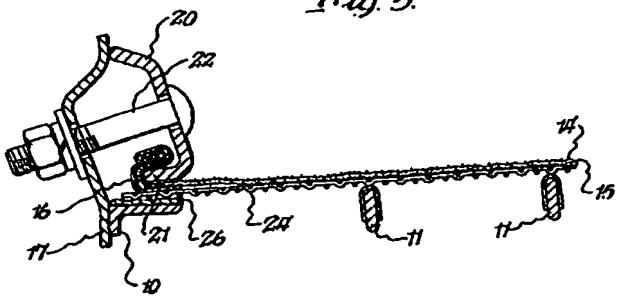


Fig. 4.

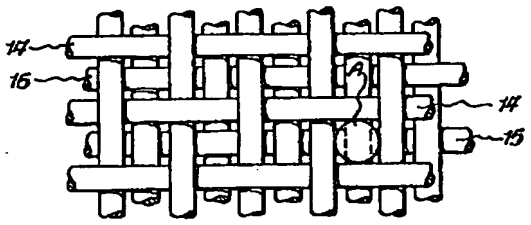
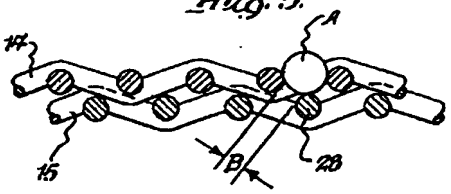


Fig. 5.



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Sheet 3

Fig. 6.

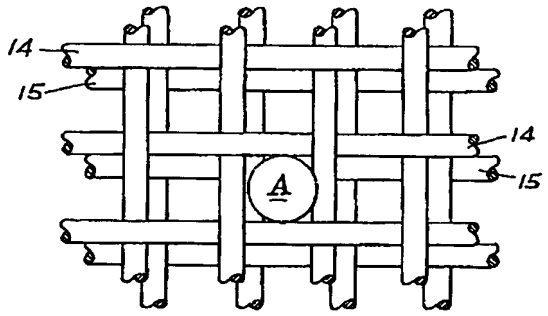

Fig. 7.